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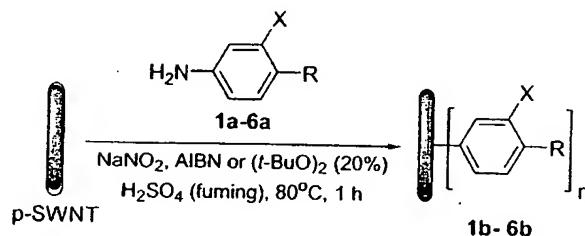
(71) Applicant (for all designated States except US): WILLIAM MARSH RICE UNIVERSITY [US/US]; 6100 Main Street, Houston, TX 77005 (US).

(72) Inventors; and (75) Inventors/Applicants (for US only): TOUR, James, M. [US/US]; 4625 Spruce Street, Bellaire, TX 77401 (US). HUDSON, Jared, L. [US/US]; 4100 Greenbriar, No. 241, Houston, TX 77098 (US). DYKE, Christopher R. [US/US]; 19611 Spoonwood Dr., Humble, TX 77346 (US). STEPHENSON, Jason, J. [US/US]; 7042 Atasca Creek Drive, Humble, TX 77346 (US).

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(54) Title: FUNCTIONALIZATION OF CARBON NANOTUBES IN ACIDIC MEDIA

Scheme 1



1a. R = H, X = H to 1b. R = SO<sub>3</sub>H, X = H  
2a. R = NO<sub>2</sub>, X = H to 2b. R = NO<sub>2</sub>, X = SO<sub>3</sub>H  
3a. R = Cl, X = H to 3b. R = Cl, X = SO<sub>3</sub>H  
4a. R = t-butyl, X = H to 4b. R = t-butyl, X = H and SO<sub>3</sub>H (~1:1)<sup>a</sup>  
5a. R = CH<sub>2</sub>CH<sub>2</sub>OH, X = H to 5b. R = CH<sub>2</sub>CH<sub>2</sub>OH, X = SO<sub>3</sub>H<sup>b</sup>  
6a. R = SO<sub>3</sub>H, X = H to 6b. R = SO<sub>3</sub>H, X = H

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(57) Abstract: The present invention is generally directed to methods of functionalizing carbon nanotubes (CNTs) in acidic media. By first dispersing CNTs in an acidic medium, bundled CNTs can be separated as individual CNTs, affording exposure of the CNT sidewalls, and thereby facilitating the functionalization of such CNTs, wherein functional groups are attached to the subsequently exposed sidewalls of these individualized CNTs. Once dispersed in this substantially unbundled state, the CNTs are functionalized according to one or more of a variety of functionalization processes. Typically, ultrasonication or non-covalent wrapping is not needed to afford such dispersion and subsequent functionalization. Additionally, such methods are easily scalable and can provide for sidewall-functionalized CNTs in large, industrial-scale quantities.



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